



# Country Report: China

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ECOPV ALLIANCE

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Technology Collaboration Programme

by **iea**



- 1、 Renewable Energy Development In 2022
- 2、 Industry & Technology & Trend
- 3、 Policies & Trend
- 4、 Cases

# 2030 Carbon peaking & 2060 Carbon neutrality Goals



- **"30.60" Goal, "carbon peak" by 2030 and "carbon neutrality" by 2060.**

**Wind+PV 1200GW by 2030.**

**Non-fossil energy 25% in total Primary energy mix by 2030.**

# History of RE Development



wind

Quality and efficiency  
development phase  
(2013-by now)

04

Scale development stage  
(2003-2012)

03

Industry  
incubation stage  
(1993-2003)

02

Application  
demonstration  
phase

01

PVPS

PV

Quality and efficiency  
development phase ( 2016-by now)

04

Whole industry chain scale  
development stage  
(2009-2015)

03

manufacturing  
development phase ( 2002-2009)

02

Small-scale  
development phase  
(before 2001)

01

# Overall development of renewable energy

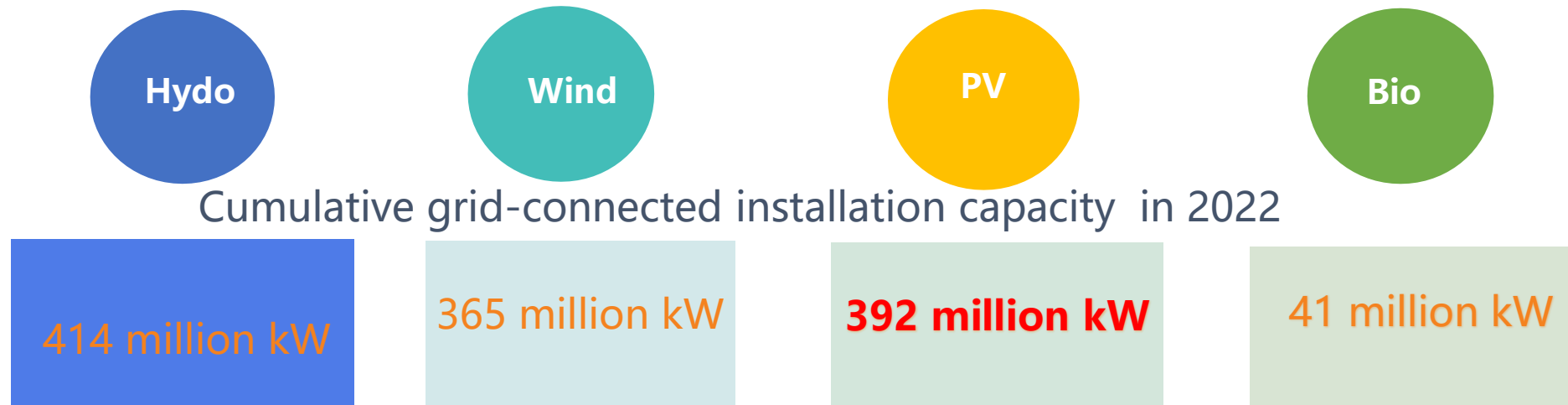


2022, China's total installed capacity of power generation : 2.56 billion kW

△The total installed capacity of renewable energy power : **1.213 billion kW**, a year-on-year increase of 14.1%, accounting for **47.4%**

China's total power capacity generation : 8.69 trillion kWh

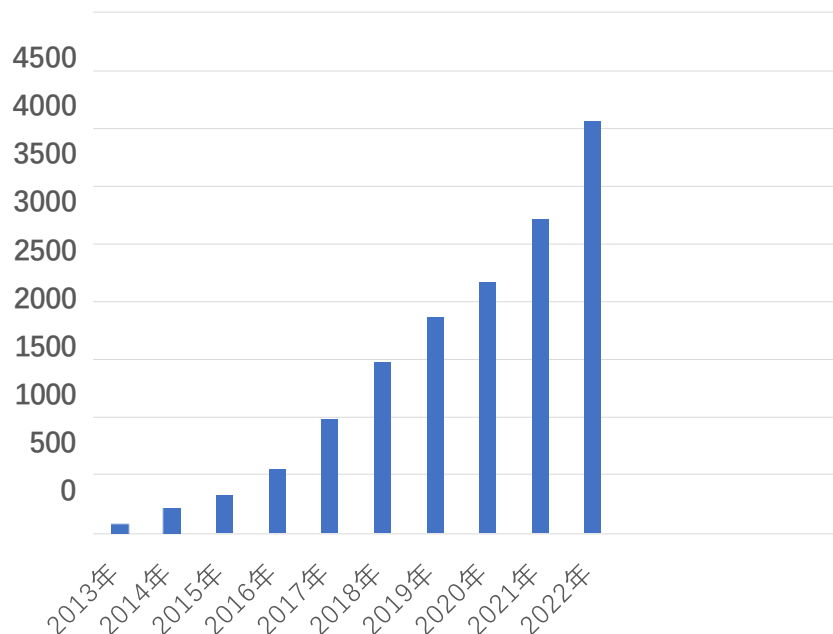
△Renewable energy generated **2.7 trillion kWh**, accounting for **31.1 %** of all power generation.



# Renewable Energy Development In China In 2022



## Annual new photovoltaic power generation (billion kWh)



In 2022, China's wind power and PV power generation exceeded 1 trillion kWh, reaching **1190 billion kWh**, an increase of **21%** year-on-year, accounting for **13.8%** of the total electricity consumption, an increase of **2%**.

427.6 billion kWh of solar power in 2022



# China's PV Application Market Development in the First Half of 2023

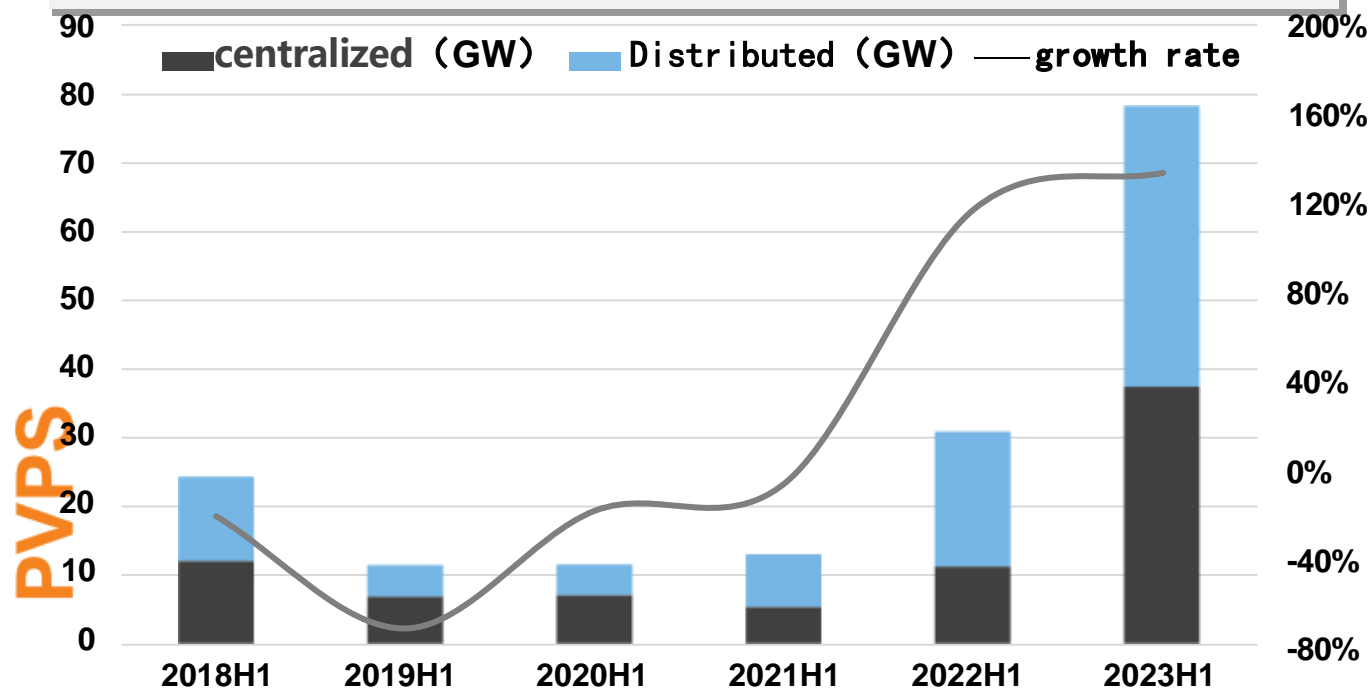


**PV power installed 78.42GW in the first half of 2023 , up 154% year-on-year**

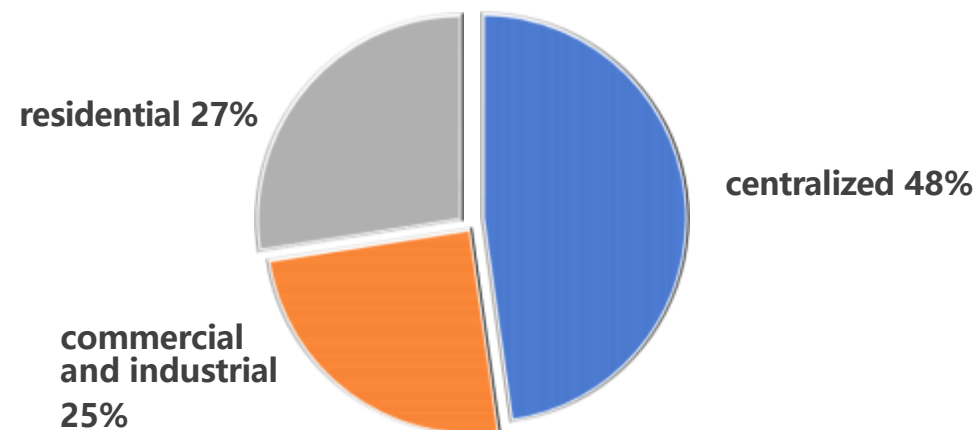
- Distributed new installations: 40.96GW, up 108.4% year-on-year
- Centralized new installations: 37.46GW, up 233.6% year-on-year

**PV power generation: 266.3 billion kWh, 30% year-on-year growth, already close to the 2020 full-year**

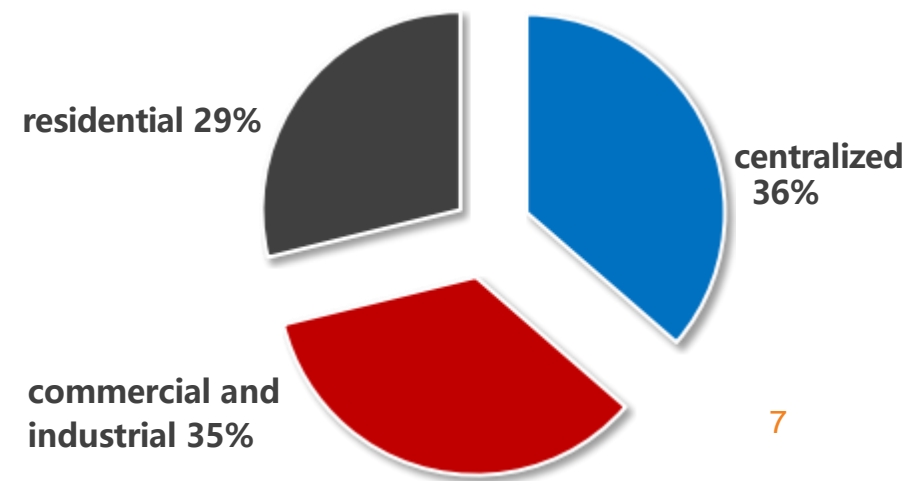
- Utilization rate : 98.2%, up 0.4% year-on-year



**Distribution of installed types in the first half of 2023**



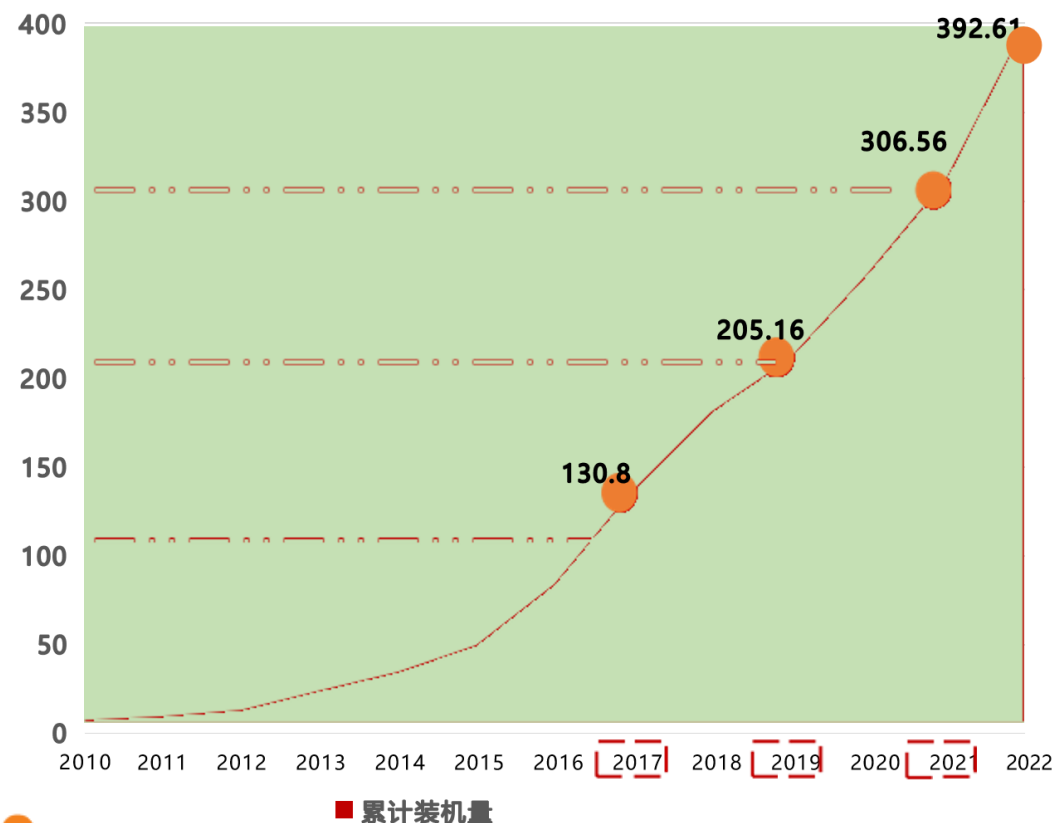
**Distribution of installed types in the first half of 2022**



# PV Market Development In China In 2022

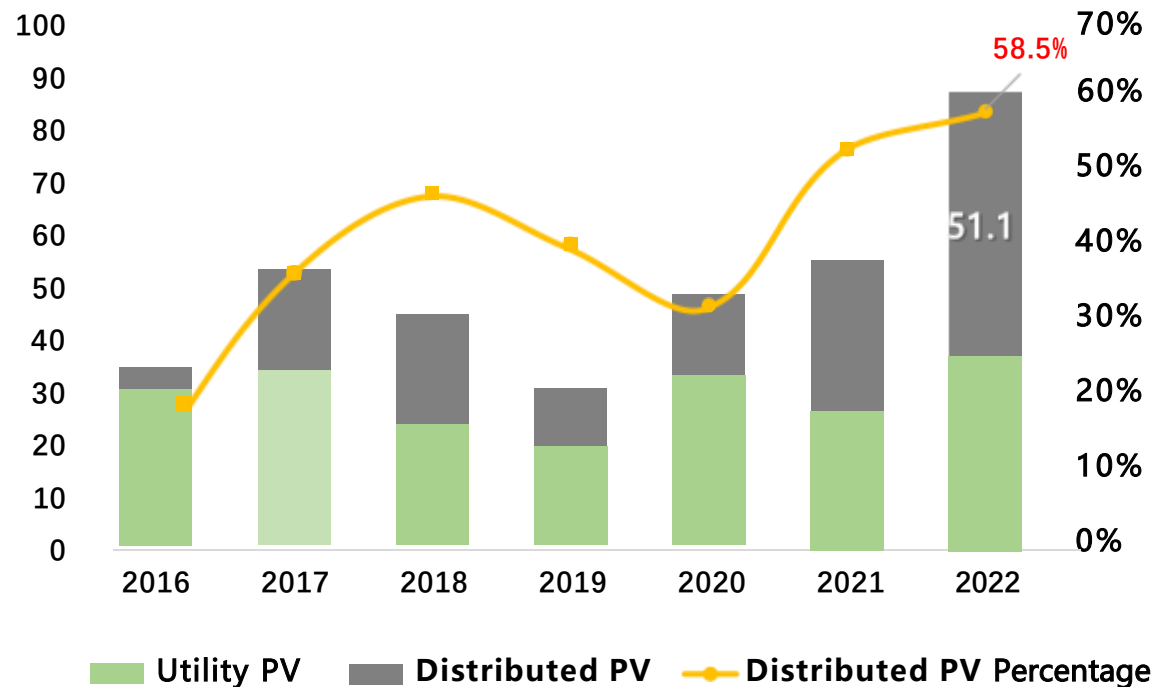


2010-2022, China's cumulative installed PV capacity (GW)



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➤ In 2022 , China's cumulative installation of PV was about **392GW**, up **28.1%** year-on-year.



➤ In 2022 , China's new PV installation was **87.41GW(AC)**, up **59.3%** year-on-year.

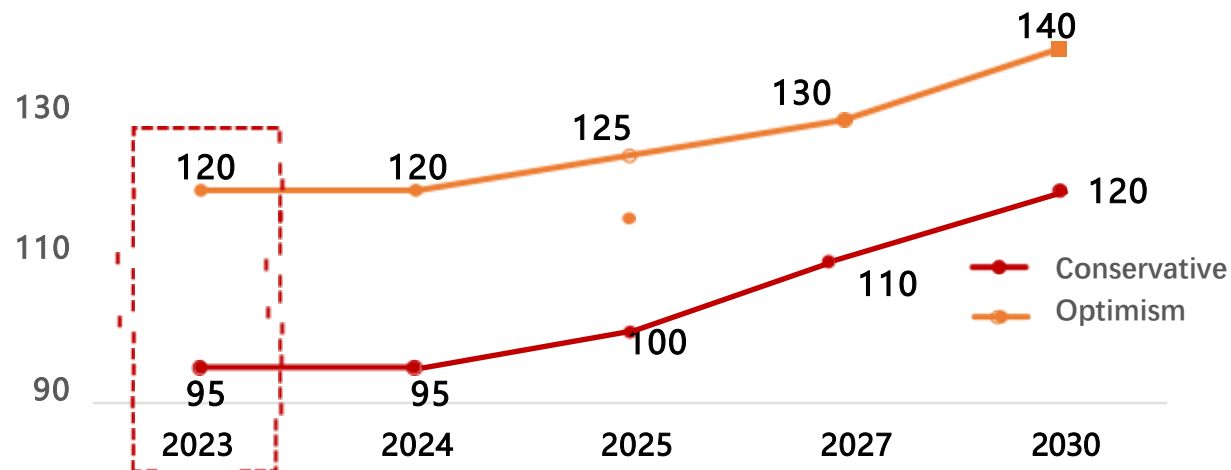
➤ Among them:  
**Utility PV installed 36.3GW**, up **41.8%** year-on-year;  
**Distributed PV installed 51.1GW**, up **74.5%** year-on-year;  
**Residential PV installed 25.3GW**, up **16.9%** year-on-year.



# Outlook For PV Market Development in 2023



**Forecast of China PV new installations from 2023-2030 (GW)**



China's new PV installations are forecast to reach **150-180GW** in 2023.



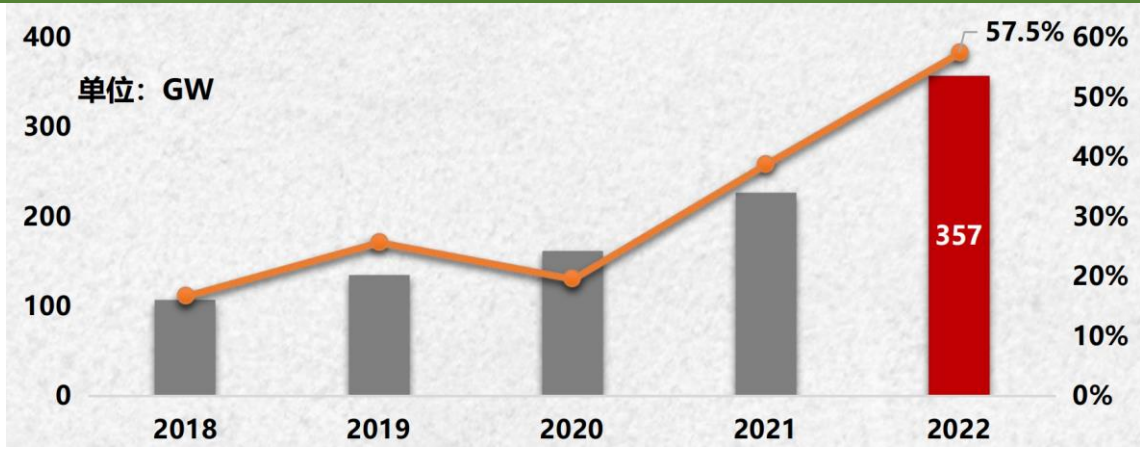
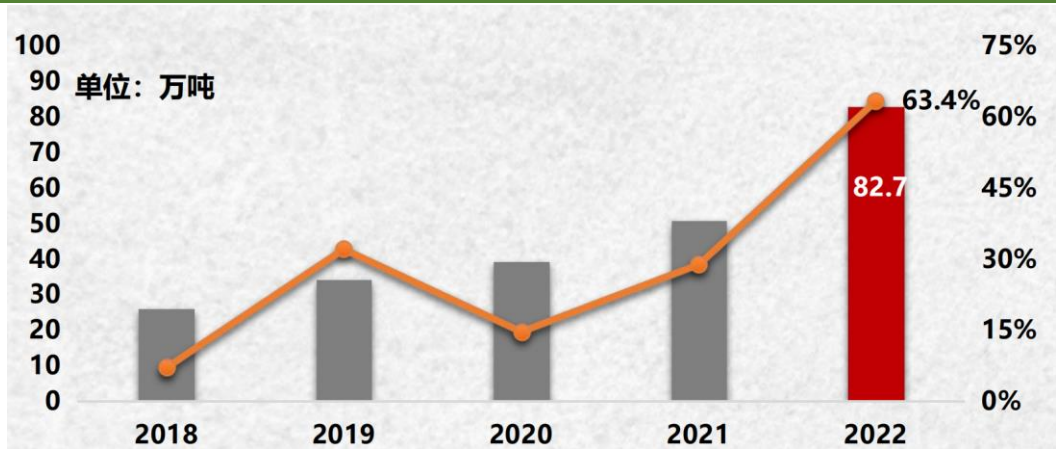
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# PV Industry Development Trends- Manufacturing



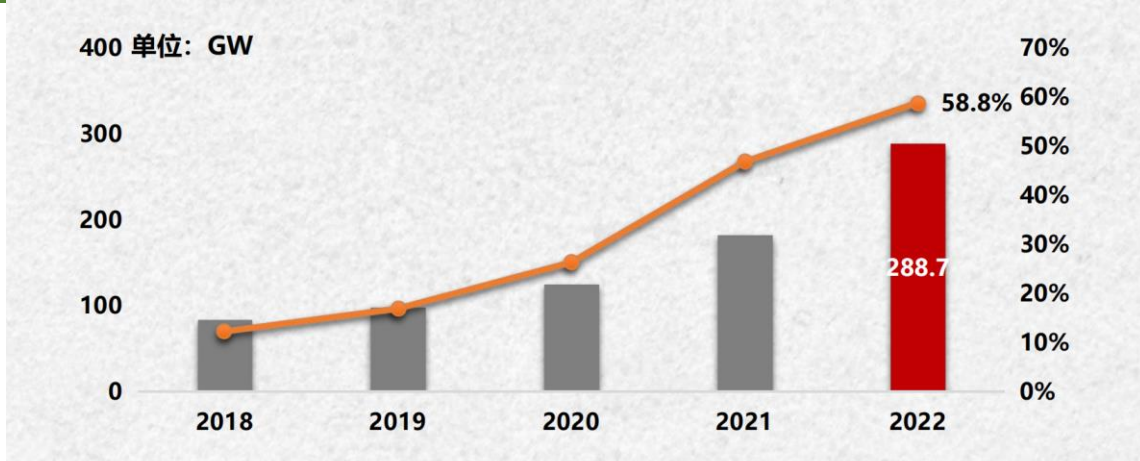
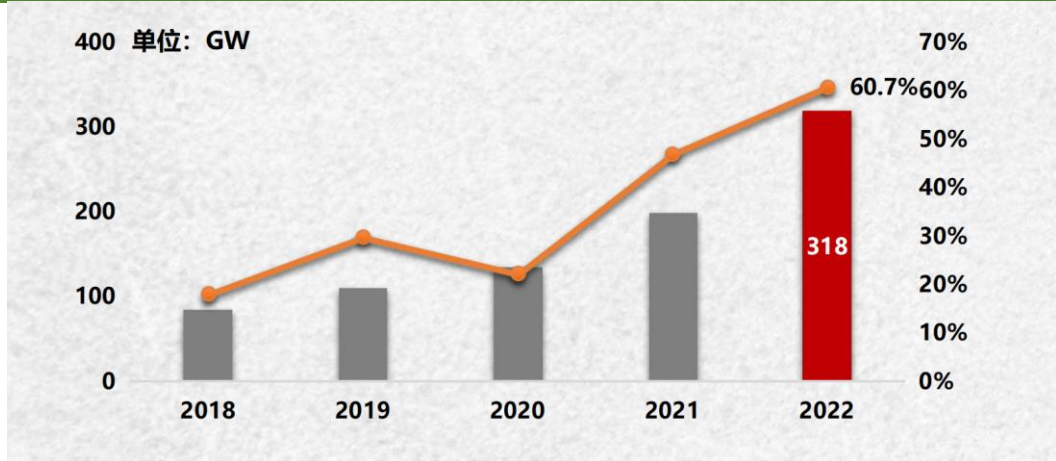
Polysilicon production in 2022 was **827,000 tons**, up 63.4% year-on-year.

Silicon wafer production in 2022 was **357GW**, up 57.5% year-on-year.



Cell production in 2022 was **318GW**, up 60.7% year-on-year.

Module production in 2022 was **288.7GW**, up 58.8% year-on-year.

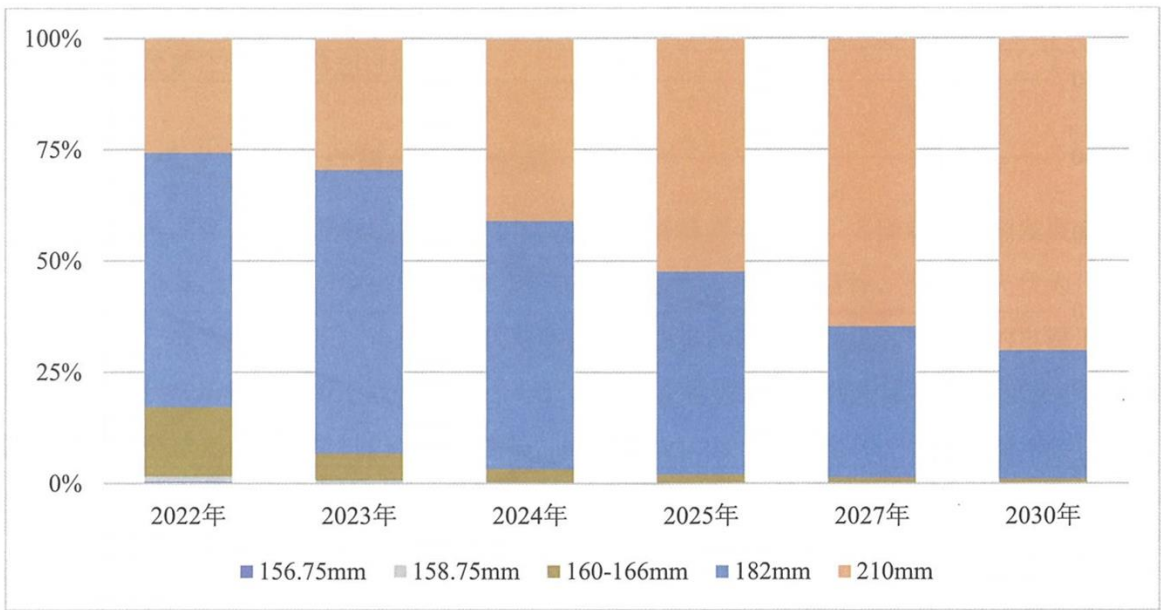


# PV Industry Development Trends- Technology



Percentage of wafers of different sizes 2022-2030

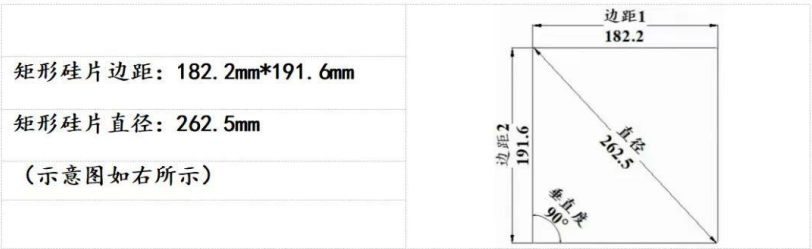
2022-2030 年不同尺寸硅片占比变化趋势



source: CPIA,2023.3

**Larger cell size:** Companies are pursuing further cost reductions, and the mainstream size of cells in 2022 has begun to shift to larger sizes.

**Wafer size:** the 182mm+210mm size accounts for 45% in 2021, rising to 82.8% in 2022 and is expected to reach 93.2% in 2023.



**Uniform module size:** to achieve cost reduction,Top 9 Module companies

July 2023, the uniform size of the 72 Rectangular cell module **2382mm\*1134mm**

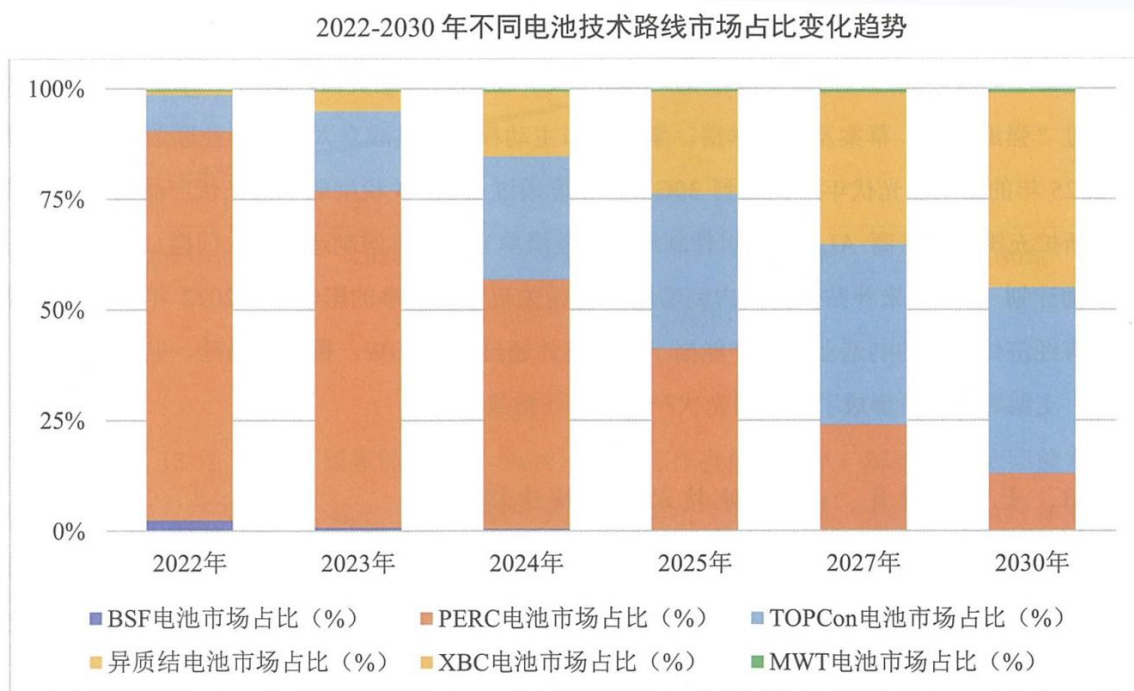
**Uniform wafer size:** The current 182 and 210 size debate has already unified the widths by introducing rectangular cells by 6 companies, Rectangular wafer **182.2mm\*191.6mm** ,which must still be heading for the next unification of sizes in the future.



# PV Industry Development Trends- Technological Route



Market share of different cells technology routes 2022-2030



source: CPIA,2023.3

In 2022 many head cell companies announced that they will expand the production of n-type cells, some of the current production capacity has been landed, and most of them are TOPCon cell production routes with high compatibility with PERC cells.

**Market share in 2022 :**

▷ **PERC : 88%---76.1% (2023)**

▷ **n-type : 9.1%---22.5% (2023)**

**n-type TOPCon : 8.3%--18.1% (2023)**

**HJT : 0.6%**

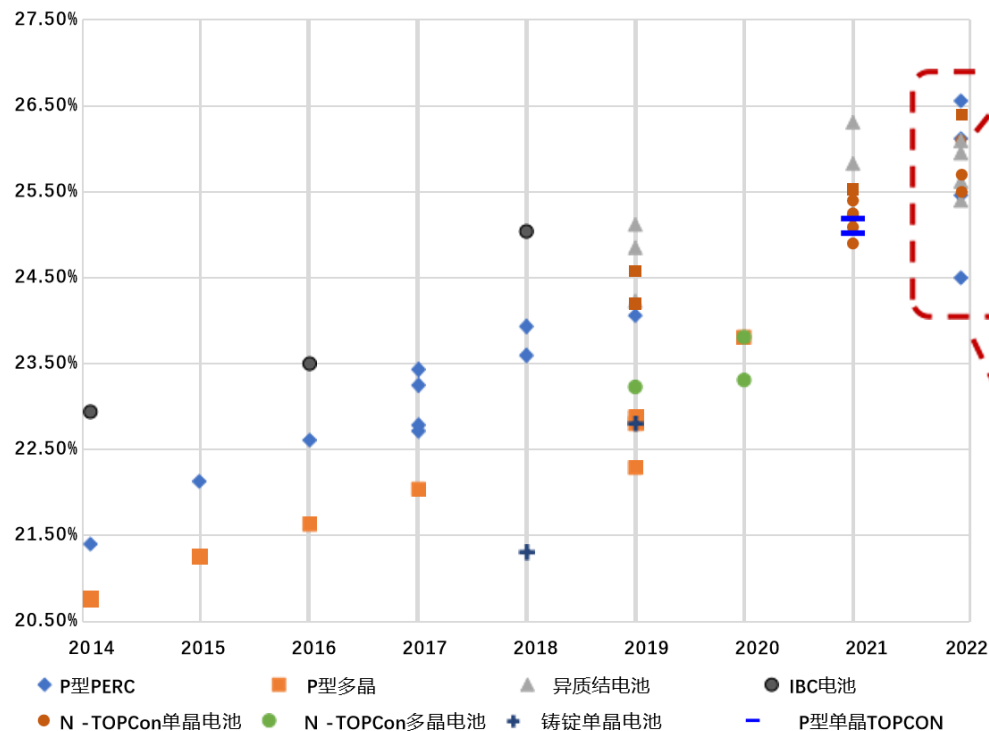
**XBC : 0.2%**

*The era of n-type cells may come!*

# PV Industry Development Trends- Cell efficiency

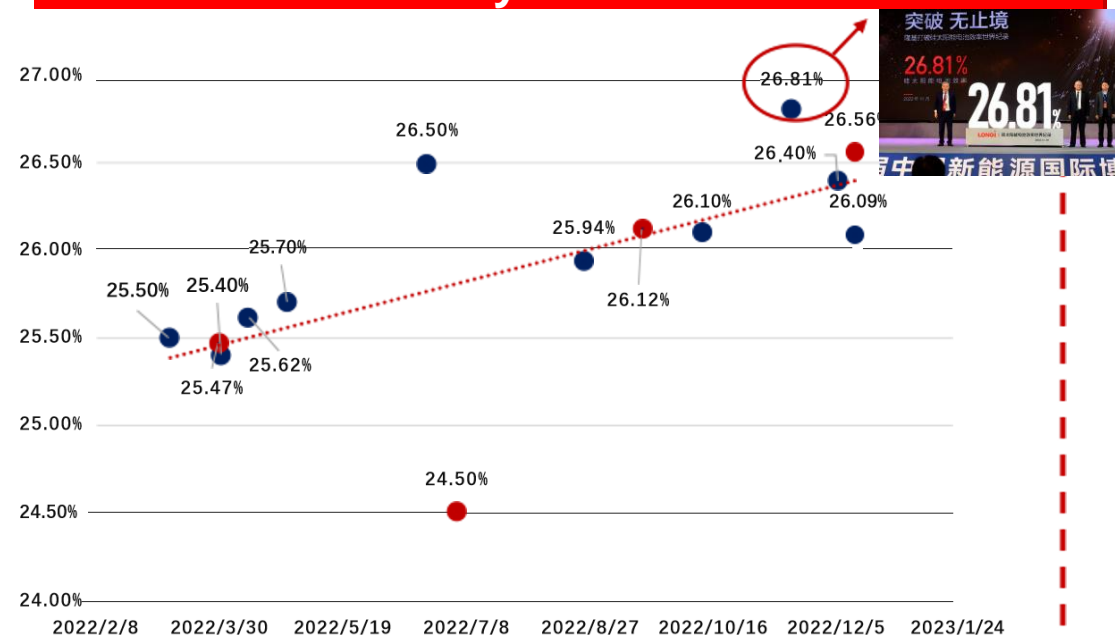


## China's crystalline silicon cell efficiency record-setting since 2014



## China's crystalline silicon cell efficiency record-setting in 2022

**The highest world record of 26.81% for silicon-based solar cells created by LONGI in December 2022**



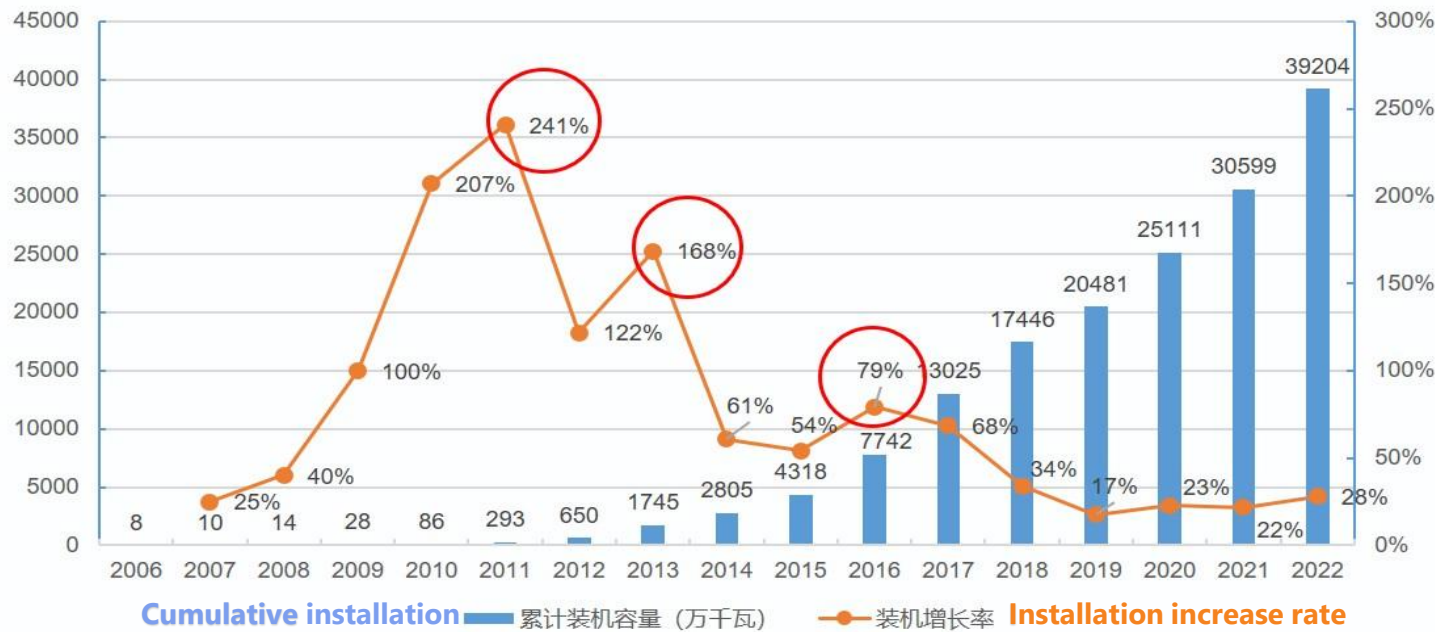
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Since 2014, China's companies/research institutes have broken records for crystalline silicon cell efficiency for **56** times;

In 2022, China companies/research institutions set efficiency records for **14** times;  
**10** of them are for n-type cell technology.

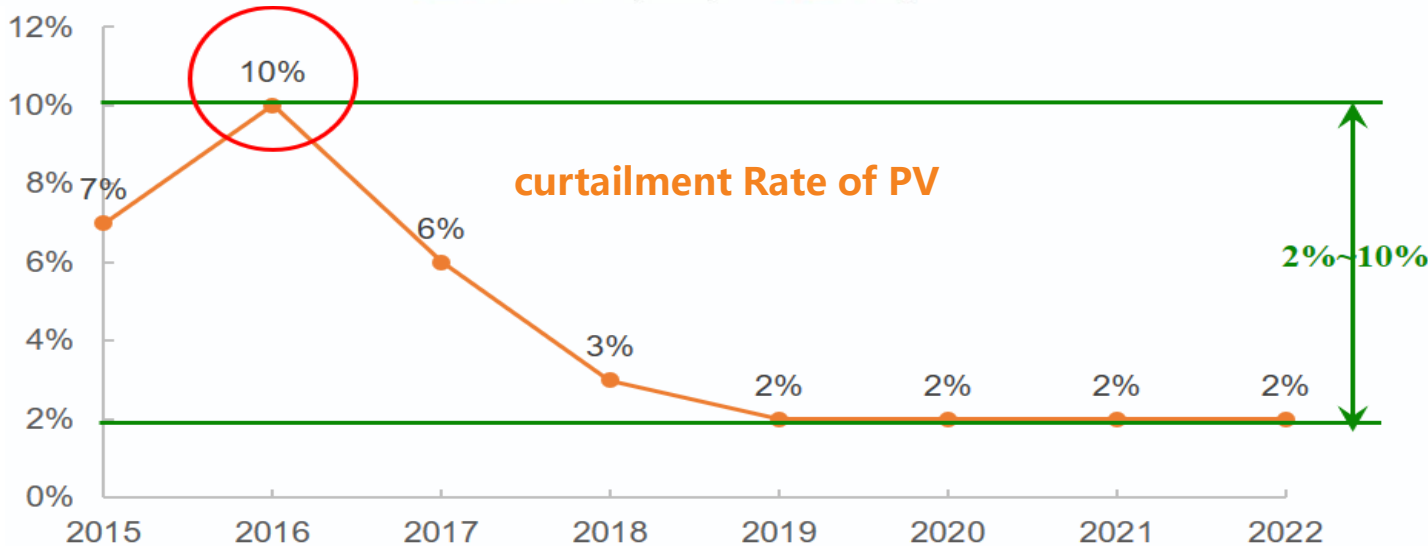


# Policy of PV Accommodation in 2022



PV power utilization rate reached **98.3%** in 2022, up **0.3%** year-on-year.

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# Policy of Feed-in Tariff Subsidies



## 01 National/local subsidy support

1

**Arranging renewable energy special fund support through the central financial budget.**

2

**Electricity tariff surcharge support. To be financed by revenues from the renewable energy tariff surcharge levied on electricity consumers.**

3

**Voluntary subscription system for green power certificates to alleviate the pressure of subsidy funding gap.**

4

**Various subsidy support policies implemented by local governments to support local new energy development.**

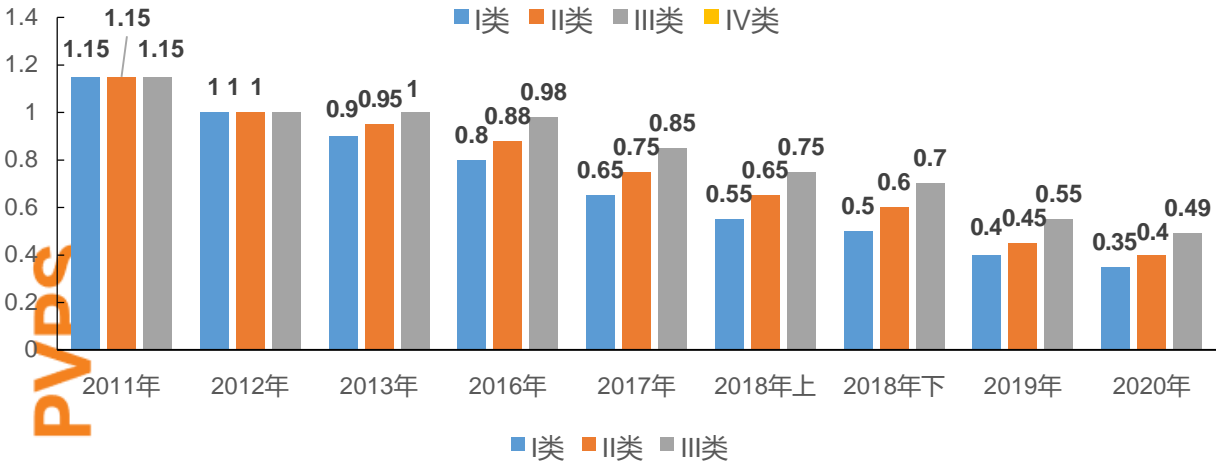
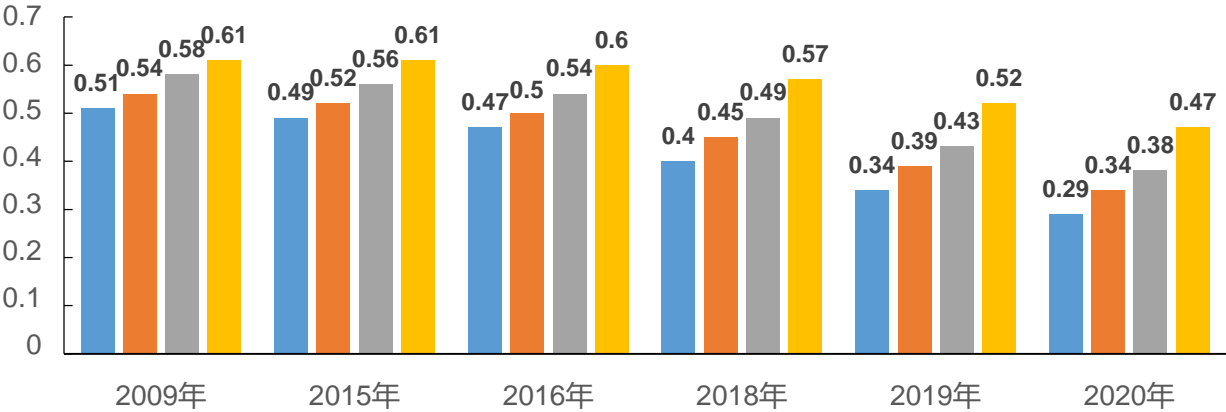
# Policy of Feed-in Tariff Subsidies



$\text{Feed-in tariff} = \text{coal benchmark price} + \text{subsidy}$

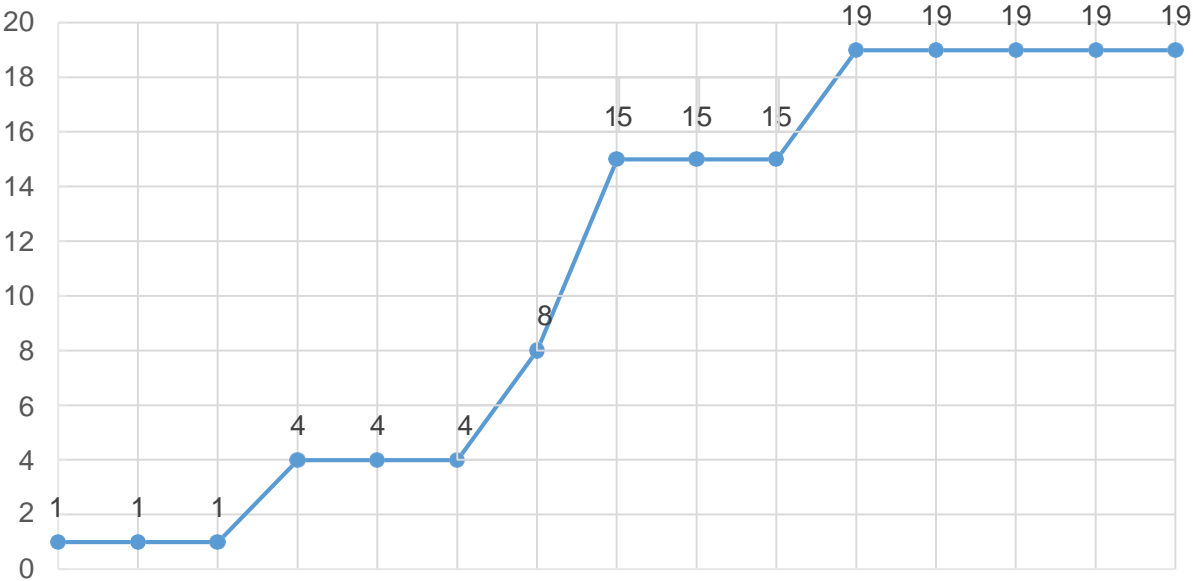
## 02 Harmonization of benchmark feed-in tariffs

feed-in tariffs for wind and solar pv generation



Changes in feed-in tariffs for wind power and PV power stations (yuan/kWh)

## Sources of funding for subsidies



Renewable energy tariff surcharge levy (cents/kWh)



## 03 low feed-in tariffs, PV parity,

### Pilots (2019)

- Carrying out pilot projects
- Reduce non-technical costs such as land use
- Guaranteeing priority power generation and full guaranteed buyout
- Encouraging compensation for reasonable returns through green certificate trading

### Full grid parity for wind and solar (2021)

- From 2021 onwards, the government will no longer subsidize newly filed centralized PV power plants, industrial and commercial distributed PV and newly approved onshore wind power projects.
- Newly-built projects are subject to the coal benchmark price and may voluntarily participate in market-based transactions to form feed-in tariffs.

### wind and solar continue parity (2022)

- In 2022, the policy of grid parity was continued for newly filed centralized PV power plants, industrial and commercial distributed PV and newly approved onshore wind power projects.

# Policy of Green Certification



## 04 History of Green Power Certificates

"Green certificate issuance and trading, expanding green certificate application scenarios, promoting green power consumption"

By the end of 2022, the cumulative number of green certificates subscribed reached 10.31 million papers, and in December 2022, the average price of green certificates for affordable PV power generation was (1 MWh) 41.2 yuan.



- Clarify that wind power and PV grid parity projects can be issued with green certificates.

- Promoting pilot work on green power trading and proposing the establishment of a unified national green certificate system.

- Clarify that green certificates are the **only proof** of the environmental attributes of China's renewable energy power.

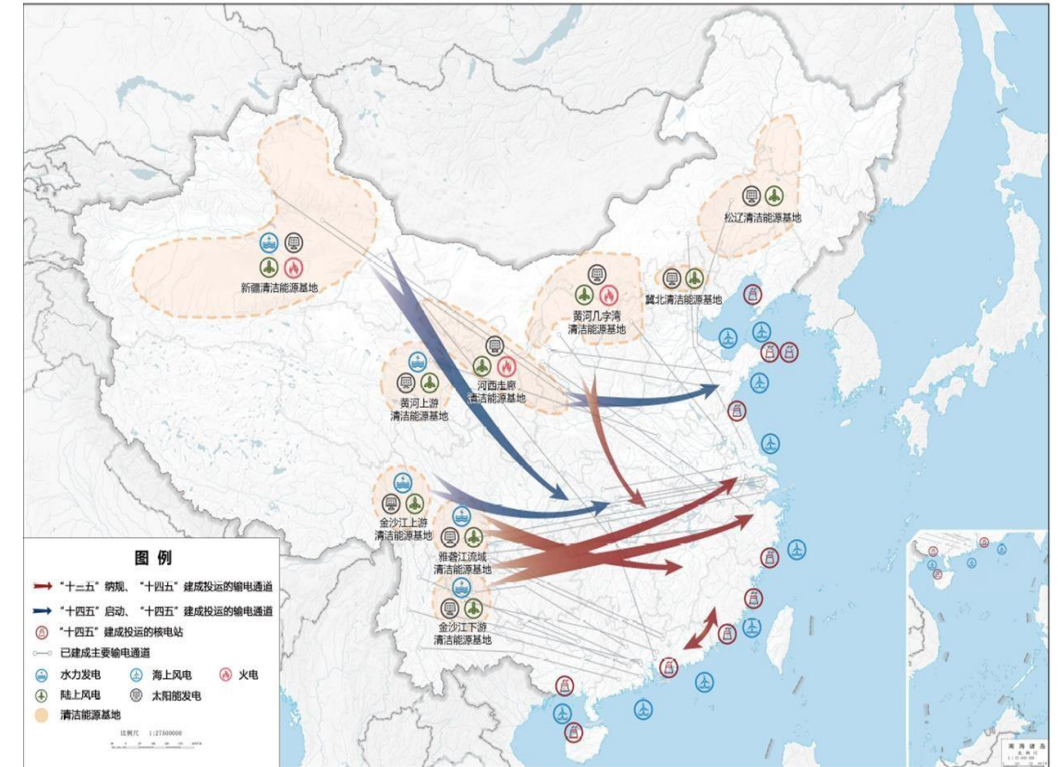






## 01 On Centralized

- ❑ The Outline of the **Fourteenth Five-Year Plan for National Economic and Social Development and Vision 2035** proposes **9** clean energy bases and **5** offshore wind power bases.
- ❑ On large-scale PV base projects, the focus in 2022 was to promote construction of **large-scale wind and PV power base** projects in the desert, Gobi, desert areas.
- ❑ By the end of July 2023, **the first** batch of 97.05 GW projects had been fully started and 30 GW had been put into operation; **the second** batch of projects had started construction one after another; and **the third** batch of projects are carrying out preliminary work.

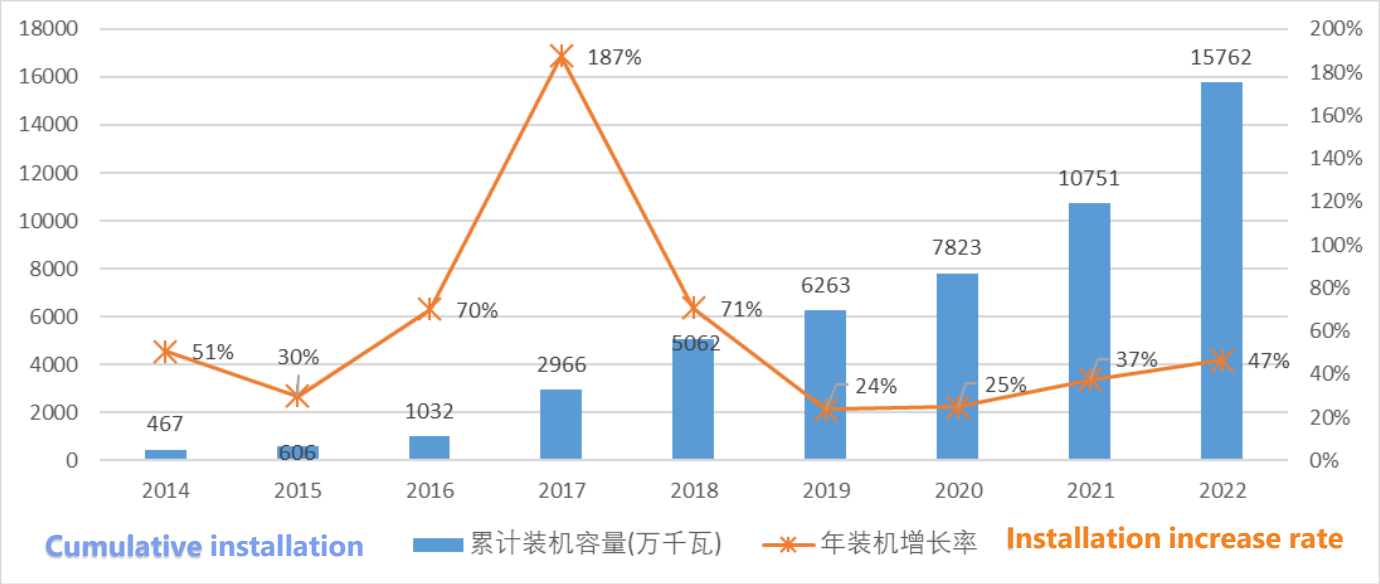




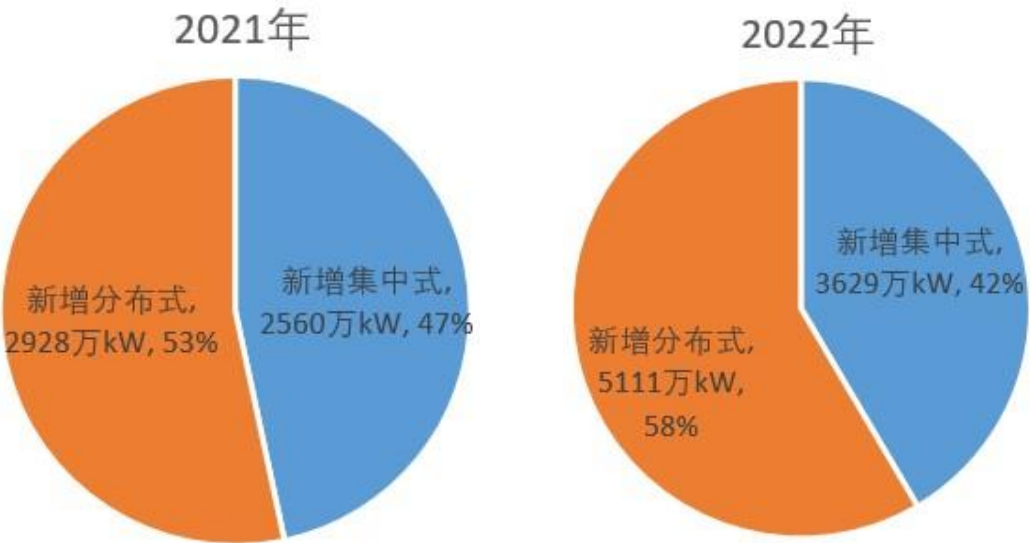
## 02 On Distributed

■ In June 2022, China issued a plan, presenting that vigorously promote the integration of PV power generation multi-scene development, and implement the **"Thousands of PV households Program"**, coordinating rural roofs with conditions or rural centralized sites to carry out distributed PV, and build **about 1,000 PV demonstration villages**, which is the important way to achieve China's rural revitalization.

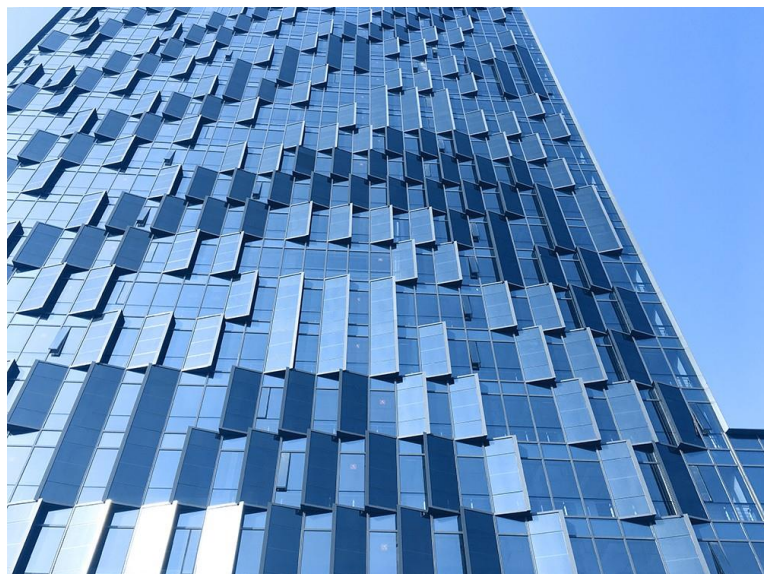
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2014-2022 Trend of cumulative installation of distributed PV power generation



Comparison of the Distribution of Newly Installed PV Power Project Types in China in 2021 and 2022



From 2019, support BIPV from energy and environmental policies.

In March 2022, China unveiled 《Green Buildings and Energy Efficiency Development Plan for the 14th Five-Year Plan Period 》 (2021-2025), proposing "**BIPV Action**", to actively promote the distributed and integrated application of PV in urban and rural buildings as well as in municipal utilities.

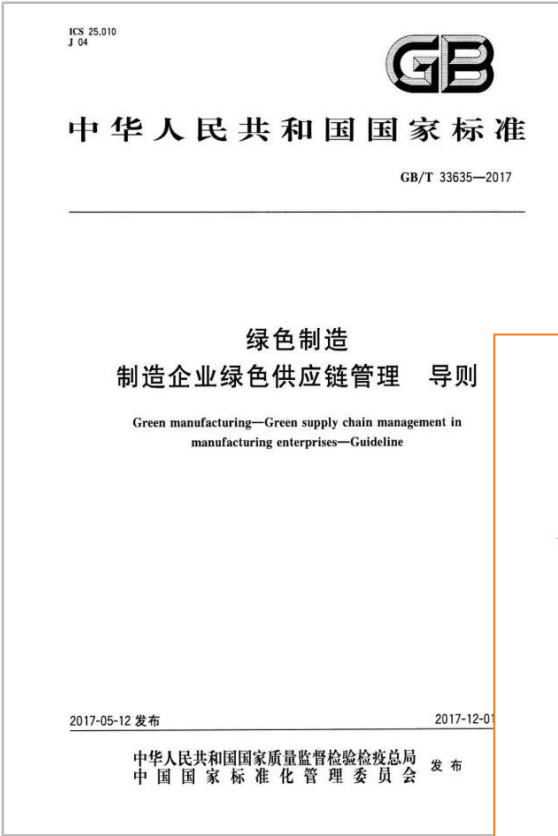
- ▲ It's expected to install more than **50GW of new BIPV**.
- ▲ The installation rate of distributed photovoltaic in new industrial parks and new large-scale public buildings should reach more than **50%**.
- ▲ To build about **1,000** PV demonstration villages.



# Green PV supply chain- standard



2018年支持的工业节能与绿色标准研究项目（绿色供应链方向）		
序号	标准名称	所属行业标准归口管理单位
1	轮胎制造业绿色供应链评价技术规范	中国石油和化学工业联合会
2	石油和化工行业绿色供应链管理要求	中国石油和化学工业联合会
3	纺织行业绿色供应链管理规范	中国纺织工业联合会
4	电子信息制造业绿色供应链管理规范	工业和信息化部电子工业标准化研究院
5	光伏企业绿色供应链管理规范	工业和信息化部电子工业标准化研究院
6	绿色供应链管理评价规范 变压器工业	工业和信息化部电子工业标准化研究院
2017年支持的工业节能与绿色标准研究项目（绿色供应链方向）		
序号	名称	所属行业标准归口管理单位
1	绿色制造 制造企业绿色供应链管理 评价规范	中国机械工业联合会
2	绿色制造 制造企业绿色供应链管理 采购控制	中国机械工业联合会
3	绿色制造 制造企业绿色供应链管理 物料清单	中国机械工业联合会
4	绿色制造 制造企业绿色供应链管理 回收利用	中国机械工业联合会
5	机械行业绿色供应链管理 通则	中国机械工业联合会
6	机械行业企业绿色供应链管理 绿色设计	中国机械工业联合会
7	机械行业企业绿色供应链管理 绿色采购	中国机械工业联合会
8	机械行业企业绿色供应链管理 绿色生产	中国机械工业联合会
9	机械行业企业绿色供应链管理 绿色回收	中国机械工业联合会
10	机械行业企业绿色供应链管理 绿色物流	中国机械工业联合会
11	机械行业企业绿色供应链管理 信息系统规范	中国机械工业联合会
12	家电产品绿色供应链管理通则	中国轻工业联合会
13	家电产品绿色供应链管理-电冰箱绿色分级评价技术规范	中国轻工业联合会
14	家电产品绿色供应链管理-绿色采购评价和管理	中国轻工业联合会
15	家电产品绿色供应链管理-绿色物流和仓储	中国轻工业联合会
16	家电产品绿色供应链管理-绿色销售和售后服务	中国轻工业联合会
17	家电产品绿色供应链管理-绿色回收和综合利用	中国轻工业联合会
18	汽车行业绿色供应链管理评价通则	全国汽车标准化技术委员会



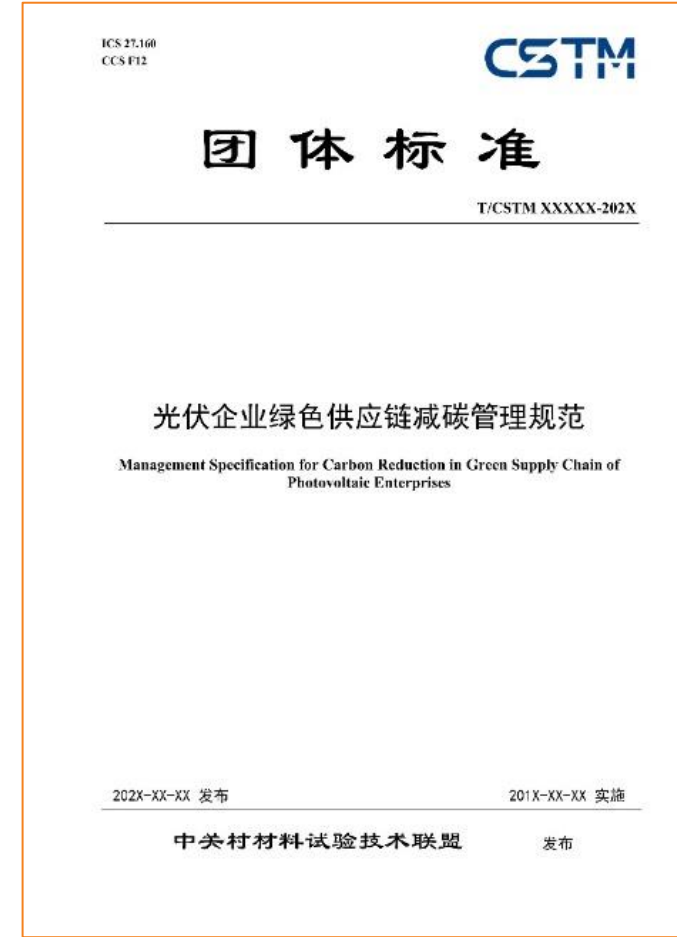
# Green PV Supply Chain Carbon Reduction System



In order to promote the improvement of the green supply chain management system, the International Economic and Technical Cooperation Center of the Ministry of Industry and Information Technology (MIIT) is carrying **out the project of building a green supply chain carbon reduction system** in the photovoltaic and other industries.



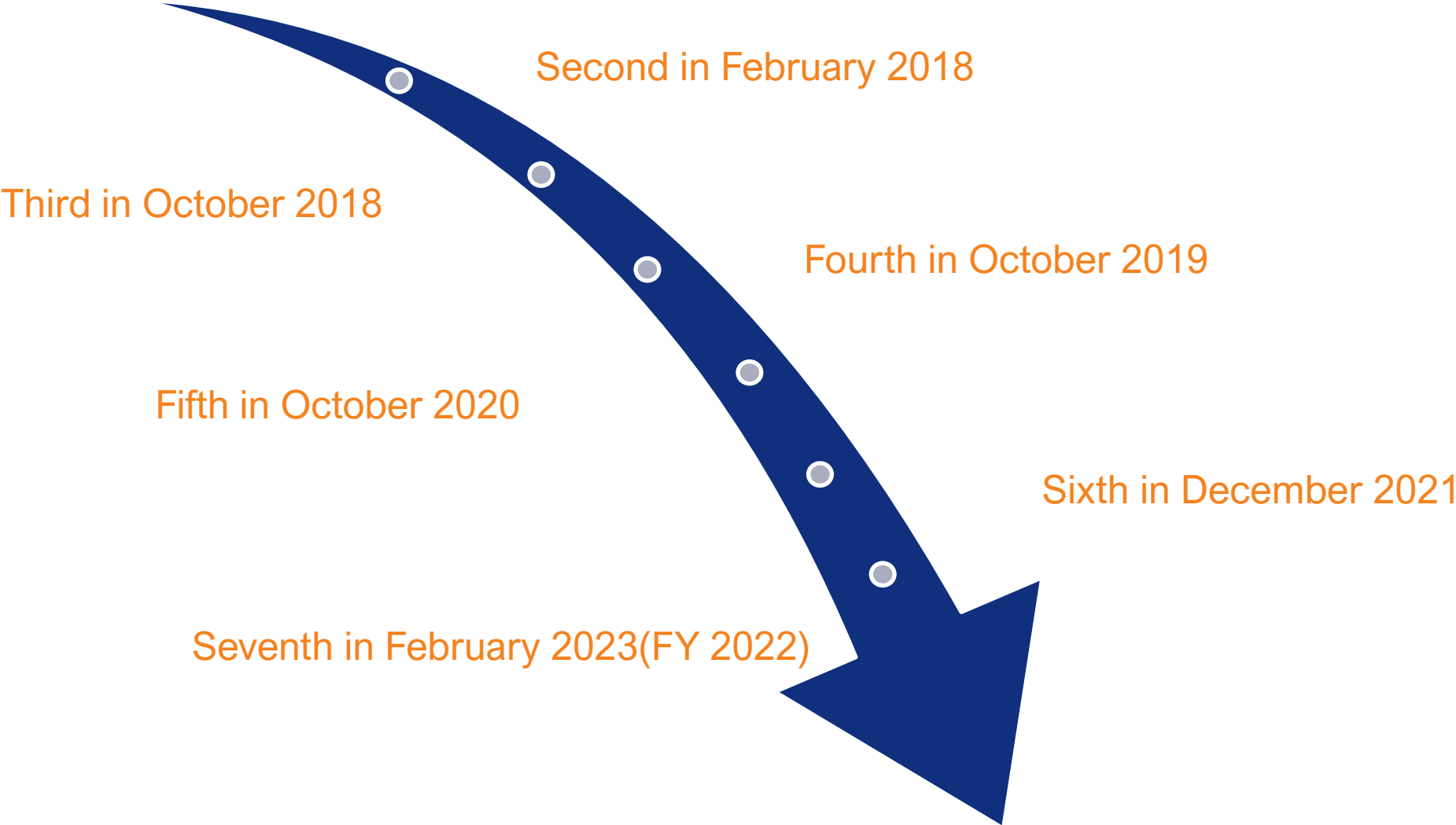
As one of the important results of the project, the group **standard "Green Supply Chain Carbon Reduction Management Code for Photovoltaic Enterprises"** has completed the discussion draft.



# Green Manufacturing Pilot



Launched in February 2017, first batch announced in August





# 2023 PV recycling policy released



On August 17, the National Development and Reform Commission issued **the Guiding suggestions on Promoting the Recycling & Circulation of Decommissioned Wind Power and PV Equipment**

The first guidance document for the PV recycling industry!

Objectives of two phases :

- **By 2025, the responsibility mechanism of centralized Wind, PV power stations recycling is basically established**
- **By 2030, the Recycling & Circulation system of PV equipment is basically developed.**

The screenshot shows the official website of the National Development and Reform Commission (NDRC). The header includes the NDRC logo and name in Chinese and English. A search bar is located in the top right corner. Below the header is a navigation bar with links to Home, Institutional Settings, News, Open Government, and Government Services. The main content area displays the title of the policy document: "Guiding Suggestions on Promoting the Recycling and Circulation of Decommissioned Wind Power and PV Equipment" issued by the NDRC and other departments. The document number is "发改环资〔2023〕1030号". The text below the title states that the policy aims to establish a responsibility mechanism for recycling centralized wind and PV power stations by 2025 and develop a recycling and circulation system for PV equipment by 2030.



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# The 19th Asian Games



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The 19th Asian Games, held in Hangzhou, China, was the first time in history that green power was used for regular electricity at all competition venues! All 56 competition venues and related facilities of the Hangzhou Asian Games have realized **100% green electricity supply**.

The green power used in the venues of the Asian Games comes from:  
**PV power generation** in Qinghai's Chaidam Basin, Gansu's Jiayuguan Pass and the Loess Plateau, as well as **wind power generation** from Xinjiang's and Bachu, etc. In addition, **distributed PV, offshore wind power and other green energy sources** in Zhejiang Province are also delivered to the various venues of the Asian Games in Hangzhou.



# LONGi & CENTER INT Case-Boao Forum for Asia (BFA)



**Project Type:** LONGi & CENTER INT BIPV Solution

**Owner:** CHINA COSCO SHIPPING GROUP

**Location:** Boao Zero Carbon Demonstration Zone, Hainan Province, China

**Photovoltaic System Power Generation:** 4.58 million kWh average annual

**CO2 Prevented:** 1.17 million tons average annual

**SO2 Prevented:** 3,392 tons average annual

**NO2 Prevented:** 1,696 tons average annual

(Equivalent to planting more than 62,000 trees)

**PV Module Installed Capacity:** 3.88 MW

**Module Type:** LONGi Roof & LONGi Park

**Timeframe:** On February 28<sup>th</sup>, 2023, the project was completed and was connected to the grid on March 15<sup>th</sup>, 2023



# Large Floating Solar Station



**Project Type:** GeguTianjin 40MW

**Owner:** SUNGROW

**Date:** 2022

**Location:** Tianjin

**Application :** Steel mill Inner lake

**Installed Capacity:** 40MW



# Thank you!

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